Geophysical Research Abstracts
Vol. 12, EGU2010-10088, 2010
EGU General Assembly 2010

Evolution of Arctic Ocean temperatures and fate of marine gas hydrates under global warming

Arne Biastoch (1), Tina Treude (1), Christina Roth (1), Lars Lüpke (1), Ewa Burwicz (1), Wonsun Park (1), Mojib Latif (1), Claus Böning (1), Gurvan Madec (2), and Klaus Wallmann (1)

(1) Leibniz-Institut für Meereswissenschaften (IFM-GEOMAR), Kiel, Germany (abiastoch@ifm-geomar.de), (2) Laboratoire d'Océanographie et du Climat

Several thousand gigatons of methane hydrates are estimated to be locked up in sediments of continental margins. Their stability is controlled by low temperature – high pressure conditions. Warming of the oceans could destabilize large amounts of hydrates along upper margins causing the release of methane, a greenhouse gas 30 times more potent per molecule than CO2, into the hydrosphere and atmosphere. The Arctic has considerably warmed during the recent decade, as witnessed by the rapid sea ice melt, and climate models project an acceleration of Arctic climate change in the future, if global greenhouse gas emissions continue to increase. Stabilized by year-round cold temperatures Arctic methane hydrates are deposited at shallow water depth close to shelf edges. Low pressure and the vicinity to the sea-air interface make Arctic gas hydrates more sensitive to atmospheric warming and associated changes in the temperature regime of the upper water masses compared to other oceans. We analyse bottom water temperatures and their future evolution projected by a climate model by applying a business as usual scenario and estimate their impact on the distribution of gas hydrate stability zones. Shallow gas hydrates are most strongly affected in areas affected by Atlantic inflow and could result in a significant impact on the methane distribution of the atmosphere, enhancing global warming